2015 COLUMBIA RIVER REGIONAL FORUM
TECHNICAL MANAGEMENT TEAM
Year End Review
December 3, 2014

FACILITATORS' SUMMARY
Facilitator: Emily Plummer; Notes: Tory Hines, DS Consulting

The following notes are a summary of the year-end review meeting and are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the "record" of the meeting, only a reminder for TMT members.

Welcome and Introductions
The Facilitator, Emily Plummer, welcomed the group to the Columbia River Technical Management Team Year End Review (YER). She encouraged participants to use the YER as an opportunity to reflect and think critically and creatively about how the 2014 TMT experience can inform process and operations for 2015. The DS Consulting Facilitation Team provided comment sheets to be filled out during the presentations. The comment sheets will be used to capture lessons learned for future management and will be collected and compiled by the Facilitation Team for later TMT discussion.

2014 Conditions Review
What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others? Is there something we can learn from this? Is there anything unique that bears sharing?

2014 Weather Review and 2014 Forecast
Kyle Dittmer, CRITFC, reported on the annual weather forecast for 2014. He noted last year was extremely dry from October through January, followed by large amounts of snow in February. By the end of spring season, the region experienced 6 months of precipitation in a 3 month period, enabling perception counts to catch up to estimated levels. Kyle also noted the 2014 weather year experienced a yo-yoing of precipitation and climate shifting, making it more difficult to predict water resources.

Moving into 2015, the Climate Prediction Center Forecast is predicting near normal temperatures with a one degree departure from November through March. Moreover, the ENSO signals suggest the region has already crossed over the El Nino threshold with a peak of warm temperatures in December followed by cooler temperatures in the coming months. Kyle forecasts near normal temperatures for 2015, with a somewhat dry winter, occasional floods, wind storms and a de-trend on warmer temperatures. Four minor snow incidents (2 inches total) are predicted from December through February and The Dalles is estimated at 97Maf (95% of the average) between January and July.

- **Participant Question:** Is 'unusual' the new 'normal' as far as weather prediction is concerned?
  - **Response:** We look at the last 20 years to base our predictions, predictability is

based on the past and lately it is much harder to correlate the past with the present. Our ability to use past models has been problematic since 2001; we are somewhat accurate overall on a seasonal basis, but on any given week you could easily have an unusual weather pattern.

- **Participant Question:** In the Lower Snake region we often fret over water temperatures. Did the warmer air temperatures impact water temperatures this year?
  - **Response:** Overall in 2014, air temperatures were above normal but there were no high peak temperatures. That being said, 2014 could be one of the hottest years on record. The Lower Snake region is experiencing warmer temperatures earlier in the season, which is resulting in earlier water release dates. How will earlier summer water temperatures affect this region and others in 10-15 years is still unclear, but I have definitely seen a shift in the last 5-10 years with temperatures warming earlier and earlier in the season.

2014 Water Management Review

Jason Ward, COE Division, reviewed the water and temperature profile for the year, reiterating that October through January was below normal for precipitation, and February saw a miraculous turnaround. February experienced rain at lower elevations, 130% of normal, with rain continuing into March. Cooler than average temperatures coupled with rainfall throughout February and March allowed for a recovery in the forecast. Into April, temperatures were near normal with a few departures; May through June saw warmer temperatures with dry conditions and slightly below average precipitation. The season was summarized as dry with dramatic wet spells then back to dry.

The seasonal precipitation conditions were near normal and slightly above normal for the upper and middle Columbia River Basin, however, Southern Oregon experienced below 50% of normal conditions. As of May 1st, snowpack was fairly healthy, 180% of normal, allowing for a promising recovery for the Rockies and the Canadian Basin. At the beginning of the water year, October 1, the drought monitor indicated no overall problems within the basin. By July, Oregon experienced a D1 moderate drought warning and eastern Washington experienced a D2 severe drought warning; some areas in the Southern Cascades experienced D4 droughts.

The Mica pool observed a maximum pool elevation of 2,473.4ft, Arrow experienced a maximum pool elevation of 1,440.6ft and Grand Coulee reached a maximum of 1,289.6ft. Daily average flows at The Dalles peaked at 358kcfs, with peak unregulated flows in March at 594kcfs. Overall 2014 was the 22nd wettest year, at 108% of normal from April through August with 94.5Maf. Additionally, the Snake Basin saw an improvement in water supply in 2014 with 98% of normal versus 69% in 2013.

- **Participant Comment:** Even though 2014 started out horribly dry, we received an abundance of snow and rainfall in February, with conditions returning to dry by May. This allowed operators to draft water when the fish needed it most, anytime you can bank the water and flush it out when it is most beneficial to the fish this constitutes a good year.

Fish Passage

Juveniles

Paul Wagner, NOAA, reviewed passage timing of juveniles at Lower Granite, McNary, Rock Island and Bonneville Dams. (Note: presentation was created by Brandon Chockley, Fish Passage Center).

At Lower Granite Dam:

- Chinook passage was close to the 50% average from 2013.
- Steelhead passage was earlier in the season than in previous years.
    - Collection and transport starting in the beginning of May.
- Sockeye were in line with 10 year average, however differentiating between Sockeye and Kokanee is difficult and Kokanee from DWR may have contributed to elevated Sockeye counts.
    - The first PIT tagged Sockeye was detected around May 7th.
- Coho witnessed two distinct peaks (May 7 and May 21) timing coincided with peak flows; hatchery releases coincided with the peaks.
- Sub-Yearling Chinook timing was fairly normal with a spike in late October.
- Lamprey peak spring passage (40%) was May 13; 90% was September 18th.
    - Lamprey can escape from the sample tank and thus collection estimates are not accurate for Lower Granite, estimates are likely underestimates.
    - 2014 was the 4th year that juvenile lamprey were recorded as a target species and were part of the PIT tag study; a five year comparison will be done.

At McNary Dam:

- Yearling Chinook peaked, with 50% passing by May 11, identical to the 10-year average. There was a lot of spill at this point.
- Steelhead had similar passage times to last year, nothing atypical about their patterns.
- Sockeye had a double peak, with 50% passing a little earlier than May 15, overall sockeye had strong numbers this year.
- Coho had an average year with a double peak.
- Sub-yearling Chinook experienced a peak on July 4th with 50% passage at that point.
- Very few Lamprey ammocoetes were sampled in 2014.

At Rock Island Dam:

- Yearling Chinook were on the 10-year average schedule, with 50% passing by May 11.
- Steelhead were on schedule with 50% passing by May 17.
- Sockeye saw 50% passage by May 14 and 90% by May 23.
- Coho were average with 50% passage by May 23, this was close to the 10 year average.
- Sub-yearling Chinook were a little late with a peak passage around July 5
- Not many Lamprey ammocoetes were collected; the small sample size did not provide reliable data, but it did show Lamprey ammocoetes and macropthalmia passing in August.

At Bonneville Dam:

- Yearling Chinook were close to the 10-year average, 50% passing by May 9, 90% passing by May 24.
- Steelhead were similar to Chinook with 50% passing by May 9, close to the expected

passage timing.

- Sockeye were quick through Bonneville, with 50% passage by May 22 and 90% by May 30.
- Sub-yearling Chinook passage rates were 10% by April 13, 50% by June 30 and 90% by July 22.
- Lamprey ammocoetes saw passage rates of 10% by June 20, 50% by June 23, and 90% by September 13; Macropthalmia saw passage rates of 50% by April 10 and 90% by July 7.

Paul also reported on noteworthy events for juveniles. He shared that there was a decrease in Chinook and Sockeye mortality at Bonneville compared to 2012. However, the weighted average for macropthalmia mortality at Bonneville, McNary and Lower Granite Dams is higher than all salmonids species. Paul touched on the sub-yearling descaling at McNary Dam, noting that it was high compared to the previous 10 years. Coho descaling at McNary was record; and although lower than in 2004, Sockeye descaling at McNary was higher than previous years. The case of elevated descaling at McNary remains unclear. Rock Island saw the lowest descaling rates in 2014.

- **Participant Question:** The Rock Island Sockeye descaling rates were very different from the McNary rates, does this trigger any concerns? Could it potentially because of sampling techniques?
    - **Response:** That remains the big question, why are the rates so different? In the future, it would be nice to know descaling triggers that call for immediate action. This requires delving deeper into the data.

Adults

Charles Morrill, Washington, reported on adult fish counts for 2014- it was a good year for adults, with 2.7 million adults counted at Bonneville Dam. This is the first time since 2001 that returns have hit 2 million. A complete table of adult counts can be accessed via the TMT YER agenda on the TMT website. Charles noted highlights:

- ***Spring and summer Chinook*** were well above the 10-year average at all projects.
- ***Fall Chinook*** counts at Bonneville were not as high as 2013, but still a very good return and well above average.
- ***Snake River Chinook*** counts were average; with a 16% difference between Ice Harbor and Lower Granite returns.
- ***Coho*** counts in 2014 were the best counts in a long time, roughly 279,300 over Bonneville and a strong return at Priest Rapids and Lower Granite
- ***Sockeye*** also had a very good year with 614,200 at Bonneville; Sockeye continue to do well at Priest Rapids and Lower Granite. The conversion rates between Little Goose and Lower Granite improved this year.
- ***Steelhead*** counts at Bonneville were good, a little below the 10-year average, but better counts compared to the last 2 years. There was a nice jump in wild fish coming through Bonneville, but numbers at Lower Granite should be higher.
- ***Lamprey*** numbers were likely underestimated due to day time counting methods, yet 2014 saw stronger numbers compared to 2012 and 2013. Lamprey had a difficult time passing The Dalles and the counts decreased between Bonneville and The Dalles. It was noted that lamprey counts that are taken during the day do not reflect the entirety of the runs. However, the numbers presented were adjusted to include day/night ladder, fishway and

ladder structure counts.

- **Participant Comment:** We know lamprey daytime counts do not give an accurate number of lamprey passage. If you add nighttime counts it doubles the total number of lamprey passing at Lower Granite. Also, the conversion between Bonneville and The Dalles is very poor; these 'lost' fish are a large concern to the status of fish in the Upper Basin.

Reservoir Operations Review
How effective were the proposed actions (SORs) at achieving desired results? What changes might be necessary to enhance results in the future? How did this year compare to others?

Libby Operations
Joel Fenolio, COE Seattle District, reported on Libby Dam operations and water supply. Libby Dam's April through August water supply forecast (WSF) from December 2013 through June 2014 varied only slightly through March, with forecasts ranging from 5.2 to 5.5 MAF. A snowy March pushed the March through June forecasts higher, ranging from 6.9 to 7.0 MAF. The December WSF of 5.4 MAF called for a relaxed December draft to 2,426.7 feet. The reservoir was drafted to this elevation and then releases were held at the minimum allowable release of 4.0 kcfs until late March. From late March through April, the reservoir was drafted at full powerhouse capacity to accommodate the increased water supply forecast. The April through August WSF issued in May (sturgeon volume is based on the final May WSF) was 7.0 MAF, which was 119% of the 1981-2010 average. The snowpack at this time ranged from 110 to 130 percent of normal. Refill began in early May and the release was reduced to 16 kcfs. The sturgeon flow augmentation volume commenced on 16 May and continued to 18 June.

After the sturgeon pulse Libby Dam is regulated with the intent of being at 2449 feet at the end of September. The operation to meet 2449 feet on the 30th of September was coordinated and vetted by TMT using the following guidelines:

- Draft Libby Dam to 2452 to 2454 feet by the end of August.
- After august release 10 kcfs until 2449 feet is reached in Sept.
- If the forebay was below 2449 feet on 31 August Libby would release the minimum 6 kcfs outflow for Sept.
- If the forebay had not reached 2449 feet by the 30th of Sept the volume of water above 2449 feet would be through the first part of October.
- The Corps will coordinate with TMT if the conditions are not present inorder to meet the above bullets.

June and July proved to be dry months with below average precipitation in the Kootenai Basin and the operation had to be changed as it was evident in August that Libby Dam would be below 2452 feet on 31 August. Releases were reduced to the summer bull trout minimum of 9 kcfs until the end of August where the forebay at Libby Dam was 2451.1 feet. Releases were held at 9 kcfs, as coordinate with BPA, through Sept 28th and the elevation on 30 Sept was 2447.5 feet.

Libby Dam reached it's peak forebay elevation of 2453.1 feet on July 22nd.

- **Participant Comment:** Jim Litchfield, MT, noted that this operation worked well, and thanked the Corps.

Sturgeon Operation/Habitat Project Update

Greg Hoffman, COE-Libby Dam, reported on the Sturgeon operation and habitat work. He noted that the operation strives to achieve temperature, flow and depth objectives stated in the 2006 BiOp. Greg explained that the operation attempts to mimic pre-dam conditions as much as possible via shaping the flow. Sturgeon spawn as temperatures are rising or leveling-off, and this year due to a large draft in spring, water temperatures did not warm up until early July. As a result, it was difficult for the operation to provide warm temperatures. However, as soon as the flow dropped off, temperatures began to climb. Over the last two years they've observed a greater percentage of tagged, spawning females upstream of Bonners Ferry than in previous years. Greg also noted that sturgeon numbers have increased as a result of the Kootenai Tribe Habitat project, which in part entails capturing sturgeon eggs and transporting them to various pools to encourage spawning.

(Note: Jason Flory, USFWS, assisted with answering questions.)

- **Participant Question:** What habitat actions is the tribe performing this year?
  - **Response:** The Tribe will be completing channel work in the straight reach near Bonners Ferry in 2015 and 2016. The work involves construction of pools and islands, and other structures and channel modifications to improve habitat and increase sediment mobility through this reach.
- **Participant Question:** How many sturgeon are there with active tags? How often do you tag?
  - **Response:** Roughly 200 total; most are adults with a few juveniles. The tag lasts up to 10 years, and a number of fish are tagged each year.
- **Participant Question:** Is there any successful survival of juveniles as a result of this project?
  - **Response:** Currently, we are trying to get the sturgeon upstream beyond gravel substrates. In terms of actual success of getting fish up there, not much yet. The habitat project has a timeline in place until 2016 for the completion of the pools. The 2015 and 2016 projects will complete the lower end of the "pool ladder" concept, and the hope is that sturgeon will utilize these pools and continue their upstream migration into areas of the river with more suitable spawning habitat, including the areas that the Kootenai Tribe of Idaho and their partners restored beginning in 2011.
- **Participant Question:** What is the theory behind the constructing the pools?
- **Response:** Libby Dam has reduced maximum flows in the Kootenai River and thus the river no longer has the power to move sediment, and it's deposited downstream of the mouth of the Kootenai canyon section, causing a widened, braided channel void of pools and areas of substantial depth. At this time most sturgeon that migrate upstream to Bonners Ferry stop their migration at the last available large pool; the concept of creating new pools is to allow fish to continue their upstream migration utilizing these deep water habitats until they reach appropriate spawning gravels and flows.
- **Participant Question:** Is spawning occurring in the lower reach? How many sturgeon are spawning?

- **Response:** Yes, significant amounts of eggs are collected in the Meander Reach annually. Currently, there are around 1,000 adult sturgeon in the Kootenai system; females spawn every 4-5 years and don't reach sexual maturity until they are 30-40 years old; males reach sexual maturity at a younger age and spawn more frequently.

Hungry Horse Operations and the Change in Columbia Falls Flood Stage

Mary Mellema, BOR, reported on Hungry Horse and the change in flood stage at Flathead River and Columbia Falls. Mary noted that Hungry Horse Dam can only control 1/3 of flow that goes through Columbia Falls, as the other forks are unregulated. This results in very limited control over flood operations. While recapping the flood stage history at Columbia Falls, Mary noted the flood stage changed from 15ft to 13ft in 1972, as determined by the National Weather Service. By December of 1997, the flood stage was raised from 13 to 14ft, until flooding occurred in the spring of 2012. The 2012 flooding resulted in road closures and agriculture loss, to which the National Weather Service then changed the flood stage from 14ft back down to 13ft.

In May of 2013 flooding occurred again, the National Weather Service noted that there was minimal impact between the 13 and 14.5ft range along Flathead River. As of 2014, current flood stage criterion is 13ft when Flathead Lake is in the top foot of full, between 2,892-2,893ft. If Flathead Lake is below 2,892ft, then the flood stage criterion is 14 ft. These are the same parameters used for modeling Hungry Horse operations.

- **Participant Question:** If Flathead Lake is in the top foot of its and Columbia Falls exceeds 13ft, would your reduce flows at Hungry Horse?
  - **Response**: Yes, if we are at 13ft and Flathead Lakes is in the top foot, that would result in a reduction at Hungry Horse.
- **Participant Question:** How do you manage flows if Hungry Horse only controls a third of the flow?
  - **Response**: We monitor forecast flows at Columbia Falls based on the North and Middle Forks, if there is space and we are able to, we decrease discharge at Hungry Horse.
- **Participant Question:** Does Flathead Lake have elevation control?
  - **Response**: It is a channel restricted lake, it can operate above full and if it is a healthy water year we keep the dam below 2,892ft.
- **Participant Question:** How often are the North and Middle Forks out of synch, what is the probability of the other two forks disrupting flow at Hungry Horse?
  - **Response**: It is pretty high, there is often good snowpack near the North Fork and even a rain event will cause all the forks to run high. Our ability to control depends on how much space is in the reservoir.
- **Participant Question:** Has this had an impact on SRDs?
  - **Response**: No, but we are consciously aware of the required space in Hungry Horse for flood control.

Grand Coulee Drum Gate Maintenance and Incremental Release Storage Program

Mary Mellema, BOR, reported on the drum gate maintenance at Grand Coulee Dam and the incremental storage program. Mary noted that in order for drum gate maintenance to occur, Lake Roosevelt must be below 1,255ft (full is 1,290ft). Maintenance takes roughly 8 weeks due to

sandblasting, repainting and working on hinge pins. As a result of the extended time, maintenance occurs in the spring months when the lake is drawn down for flood risk management. The ability to defer maintenance is permissible as follows: 1 time in 3 years, 2 times in 5 years or 3 times in 7 years. In 2015, drum gate maintenance is required (as a result of deferred maintenance in 2013 and 2014) and if necessary there will be a forced draw down.

Mary also reported on the Lake Roosevelt Incremental Storage Release Program, noting that the program requires releases of extra water from Grand Coulee for specific uses. The water is contracted by various downstream entities such as irrigation, government municipalities, instream water and industry. The program has been intact since 2009, with 25,000 acre-feet (AF) allotted to municipal and industrial uses, 30,000AF allotted to Odessa, 44,500AF for stream flows and 33,000AF for interruptible water rights. While this program has been around since 2009, only 25,000AF was released in the last 4 years of the program. Thus, since 2014 the program has yet to utilize the full amount allowed (82,500AF or 132,500AF in the driest 20% of years), and it is unclear when the program will take full effect. Presently, issues remain on permitting actions for the remaining volume of water and agreement amongst the advisory panel of fisheries and water managers as required by the EIS. As of 2014, 12,260AF was released in April, May and June and 12,240AF was released in July and August.

- **Participant Question:** Where is the trade-off? Where is this extra flow coming from?
  - **Response**: It comes from Lake Roosevelt, it is hard to say how the water would be used if not for this program, maybe it would be pumped to Banks Lake or something.

Dworshak Spring/Summer Operations

Steve Hall, COE Walla Walla District, reported on spring and summer operations at Dworshak. Steve noted that there was a jump in the water supply between January first and the middle of April as a result of heavy rainfall. The water supply increased from 84% up to 120% of normal indicators, later falling to 110%. The reservoir refilled by the end of June, and was drafted down to 1,520ft by the end of September. The BiOp operation failed to meet the August 30th target elevation as a result of an unplanned Unit 3 outage, which limited discharge capacity. As the water supply increased, the operation kept drafting as required by the flood control rules.

Throughout April, a 25kcfs output was needed to meet flood control requirements. Toward the end of April inflows were targeted to match powerhouse capacity around 10kcfs and the pool was refilled before the end of June. Additionally, temperature augmentation began on July 7 as consistent with past years.

Water temperature released from Dworshak averages around 45 degrees, however this year temperatures reached 50 degrees by the end of September, there were wind mixing events that contributed to higher water temperatures. Additionally, Unit 3 was out and the project could only pass 12kcfs in order to maintain TDG levels; DWR capacity to pass water was decreased by 50%. This resulted in Lower Granite tailwater as high as 68 degrees Fahrenheit. There were TDG exceedances (115%) in late August.

- **Participant Question:** Historically, the average water temperatures used to be closer to

43 degrees, now the new average is 45degrees, would this appear to be a warming trend in the reservoirs?

- **Response**: The hatcheries request that we keep temperatures in the 45 degree range as long as we can, later on in the summer we begin to see constraints and lose the ability to get temperature down this low. I am unaware of changes in reservoir temperatures compared to past years, possibly this temperature raise is due to drafting techniques, we drag warmer waters closer to the bottom where the drafting occurs.

Spring Operations Relative to Flood Control, Fish and Power Operations

Steve Hall reiterated that by June 1st temperatures in the Lower Granite pool were still cool, by June 10th the reservoir was at 1,580ft and by June 24th the reservoir was within 5 feet of full. Temperatures began to warm up around this time, the Lower Granite pool experienced wind mixing and by June 29th the operation was releasing 11 to 12kcfs. Into July, outflow was at 7.4kcfs and temperatures in tributaries continued to warm. By July 10th, heating in the pool continued and below Dworshak temperatures were around 54 degrees. By August 10th, the amount of warm water had steadily increased and mixing occurred on the top layer of the pool; little could be done at the time with only 5 kcfs of outflow through the powerhouse. Additionally at this time even 8kcfs would not be enough to counteract the 10kcfs coming in from the Snake River and solar radiation increasing surface temperature. By September temperatures cooled down and there were no TDG exceedances in September.

- **Participant Question:** Looking forward to 2015 and returning to MOP, would a decrease in volume enable Dworshak releases to be more effective?
  - **Response**: A very small amount if any at all(eg 2% change). One thing we are trying to do this year is purchase some weather equipment and establish additional weather gauges in the pool so we know when wind mixing occurs. This may give us some lead time to change the current operation or in the very least know when wind mixing is occurring the pool.
- **Participant Question:** Is the water released from Hells Canyon also heating?
  - **Response:** Unsure, if the temperature is changing, we have little knowledge of the Hells Canyon releases.

Upper Snake Flow Augmentation

Ted Day, BOR, reported on Snake Flow Augmentation, noting the basic tenets for the project include (1) flow augmentation must be water that would otherwise not be there (2) augmentation must occur between April 3 and August 31 and (3) BOR must be able to clearly report on the volumes and timings of the augmentation water. Ted continued to explain that prior to 2008 the Upper Snake experienced down ramping at 100cfs/day, this was very restrictive and only allowed the operation a ceiling of 1,500kcfs without overshooting the target volume. As a result, the volume of flow augmentation and ramping rate forced releases well into August. Per the 2008 BiOp, the goal shifted to get the water out earlier, or at least prior to the August date. The solution to achieve this emphasized getting rid of the ramping rate. Ted reiterated that prior to 2008 in Boise, the flow augmentation usually did not start until mid to late June and flows were limited to 600cfs due to safety concerns. With this operation in place, the flow augmentation was typically completed before the end of July.

Ted noted a possible strategy to remove water faster, before summertime, entails continuing inflows for another week or two rather than cutting inflows at the end of flood control. He continued, if the system is assured to physically refill, the other option is to deliberately not top off the system. This means, any fill into this space must be evacuated or otherwise delivered as flow augmentation. He noted this strategy is not a "blank check" to call flood control water as augmentation water, it must show beyond a reasonable doubt that the system would have otherwise physically refilled. Ted also insisted that this strategy may not be possible in every flood control year.

- **Participant Question:** Would it be possible to front load the powerhouse even more rather than taper down?
  - **Response**: If we could draft Cascade below a certain point, then yes that is a possibility. Some years we have run at powerhouse capacity the entire augmentation period, other years we were unable to start until July 1st, we are proactively trying to finds way to do this.
- **Participant Question:** Where are your measuring points?
  - **Response**: The actual measuring point for Boise is Milton, Payette is Payette and for the Upper Snake it is Milner.
- **Participant Question:** How do recent Idaho laws affect flood control?
  - **Response**: There is a lot of discussion of how to account for flood control, it remains an ongoing issue and it is currently unsettled. We continue to fight for our flow augmentation program on a yearly basis.

2014 Lessons Learned Reservoir Operations Review

Review of Specific Operations: What was learned about specific operations that were requested by TMT members or other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?

2014 Juvenile Salmon Survival, Juvenile Transport Adult Returns

Steve Smith, NMFS Science Center, provided an update on juvenile salmon survival, juvenile transport adult returns and smolt survival. Spring of 2014 provided average conditions when looking at flows, spill, and water temperatures at the Snake River dams. Steve noted travel times continue to be shortened, juveniles are moving quickly through the system due to spill and surface structures. Roughly one third of smolts were transported in 2014. Spill continues to be just above the mean and water temperatures for 2014 were a little cooler than the average.

Steve noted this is the 22nd year using the PIT tagging system, with 7 hatcheries in the Snake River basin releasing PIT tagged fish since 1993. The average survival rate for PIT tagged fish from their release point to Lower Granite is 71.4% yearling Chinook survival rates from their release point to McNary is 57.15% and Steelhead in the Upper Columbia survival rate is 46.8%, up from last year's average of 38.4%. Steve reiterated that yearling Chinook continue to experience faster travel migration times, regardless of flow or spill. Steelhead survival appears to be more variable, this suggests problems with the data and modeling near John Day and Bonneville. Estimates of 108% and 98% indicate a model violation and incorrect Steelhead survival estimates for the year. Overall, yearling Chinook were steady for 2014 at 49.7% and Steelhead was 77.1%,

though this estimate is likely too high.

The transportation study includes PIT tagged yearling Chinook and Steelhead that are collected at Lower Granite and either transported or bypassed in-river. The 2011 return rates of tagged fish were very low, new data for 2012 Steelhead indicate the returns are improving. For 2012, the wild Chinook transported had the same return rates as those bypassed. In most cases the numbers are very close between transport and bypass, yet transport fish tend to have higher return rates. Due to improved in-river conditions, the benefit of transportation was reduced between 2008-2011.

- **Participant Question:** You mentioned concerns over model violations, could you please provide an example?
  - **Response**: One thing that causes problems is if fish use multiple ways to pass projects, then they have differing survival rates downstream. The model assumes that the experience at one dam doesn't affect downstream passage. This is problematic.
- **Participant Question:** In 2014 we invested a lot of time on this topic at TMT meetings, from what you saw this year are you anticipating a different tone to the conversation for 2015?
  - **Response**: All of the plots show that data upstream of Lower Granite and at Lower Granite are completely independent, if that is the agreeable to TMT members we will continue to provide that information, for the most part fish tagged at Granite have a higher TB ratio, but not in every case.

McNary Dam Operations and Juvenile Descaling Review

Ann Setter, COE Walla Walla, provided an update on the descaling at McNary Dam, she noted this year at McNary the Sockeye descaling rates were noticeably higher than previous years. Ann looked back at historical smolt monitoring data and noticed that large numbers of fish passed through the collection facility in 2012 and 2014; in 2012, 164 Sockeye were descaled compared to 581 in 2014. Data from 2013 was less helpful for comparisons due to fewer fish moving through the bypass system. In 2014, Sockeye collection was at a high from May 9-May 15 and descaling rates were roughly 42% at this time.

In order to narrow in on factors contributing to descaling, the project operated units at the midpoint, however, this did not appear to decrease descaling. Although not definitive, debris is thought to have contributed to the increase in descaling. The trash racks were regularly cleaned to see if there was an impact on descaling rates; over 1000 cubic yards of debris were removed; however, the raking did not correlate with decreased descaling. Additionally, some trash raking revealed no trash on the racks. Floating debris may also contribute to descaling; Ann noted they are acquiring funds to purchase a log bronc in 2015 to assist with debris removal. It was noted that in 2013 more debris was collected than in 2014. There was question as to if the descaling issue could be influenced by more than one project, however, it is uncertain at this point.

- **Participant Question:** What happens in 2015 if descaling is still high? What can we do different if this problem still exists?
  - **Response**: We are trying to acquire a log bronc to move the debris mat in the forebay; we will also continue to monitor and clean the racks.

- **Participant Question:** Is there any plan to control the tumbleweed in the future, maybe an invasive species prevention/control effort?
    - **Response**: In the past there has been a burning program, this year there was not. Hopefully, it will be reinstated.

Factors Influencing High Sockeye Descaling rates at McNary Dam

Trevor Conder, NMFS, reported on factors influencing descaling rates, he reiterated that for 2014 rates were higher than normal. Trevor noted that generally speaking, descaling rates around 5% are okay, however, 10% causes alarm and 20% or higher is of great concern. Different populations of fish experience different rates of descaling; Sockeye tend to be more susceptible, as are wild fish (hatchery fish have a thicker body wall in general), small fish and fish passing through the system later in the run also are more prone to descaling.

In early June it was noted by researchers at Priest Rapids that Sockeye descaling was high. Preliminary survival estimates from RIS to MCN are the lowest to date, around 40% compared to 80% in the Snake River. Trevor reiterating concerns around debris, noting that trash rack cleaning could be more frequent, specifically in May when large amounts of debris were pulled. Additional proactive measures to lower the descaling rate currently include, dam repair at Wanapum, adding a log bronc to McNary's fleet and addressing other debris removal strategies at FPOM.

- **Participant Question:** Are you able to tell that descaling occurred at McNary, is it possible it occurred somewhere else, at another project?
    - **Response**: The slime layer regenerates in 24 hours, it is unclear if descaling was fresh from McNary.

Lower Granite Dam Adult Trap Operation

Ann Setter, COE Walla Walla, reported on the Lower Granite Dam adult trap operation. She noted that 2014 was a good year with no stalling in the ladder and fish passage went undisturbed even with warm temperatures. In 2014, there was a total of 74 days when the trap failed to operate, often for short durations (due to mechanical failure and ladder water temperatures). Moreover, this outage is the first one since 2007 that extended beyond 41 days.

The timeline of events began with mechanical failure on July 7th. Due to warmer than average water temperatures, an auxiliary pump was utilized to cool water in the ladder. Contracting for the rental pumps was initiated, however, there were delays and the additional rental pumps were not installed until August 6th. In August, temperatures were still warm and the traps were not operating between 5:00AM and 3:00PM. By August 21st, rental pumps were operating 24 hours a day yet the trap was still not operating properly due to warmer temperatures. By September 1st the trap went into continuous operation until September 24th, when the powerhouse went out of service around 5:00AM, as a result very few fish passed that day. Adult counts from July 19 to July 24 showed very little passage. At Lower Granite, passage of fall Chinook was more consistent than 2013.

Unfortunately, the intake chimney and pump extension on the auxiliary pumps will not be installed until 2016. Additionally, a new rehab juvenile fish facility, which will provide another ladder for

passage, is expected to be completed by 2017.

Looking back on the effectiveness of rental pumps for 2014, it is crucial there is preliminarily planning to support getting rentals on site as needed without delay. These pump failures are treated as emergencies and the project needs available staff and engineering support to properly handle unexpected outages.

- **Participant Comment:** The sooner we start the process of obtaining rental pumps, the better off we will be. We know that we will need rental pumps at some point in the future, it is best to set that process in place ahead of time.
- **Participant Comment:** We appreciate the Corps' efforts during the pump failure. We should use 2014 as a lesson learned and note that obtaining rental pumps takes time.

Other Lessons Learned

Given the review of conditions, decisions and actions throughout the day, what are the overarching lessons that could impact future work of the TMT? Are there themes that might need further discussion at a future TMT meeting or other regional work group?

Participants were given time to reflect on the lessons learned during the Year End Review and were asked to record the lessons learned on their comment sheets. The comments will be compiled and provided to TMT for review and discussion in early 2014. Additionally, in small groups they discussed what have they learned this year that will inform future problem solving and decision making?

- Lessons learned from 2012-2014 Libby operations may streamline 2015 operations.
- Mid-Columbia operations may inform 2015 McNary operations regarding descaling.
- Upper Snake flow augmentation –fill in the natural troughs or help peaks?
- Highly varying weather patterns means more nimble operation response?
- Varying flood stage at Columbia Falls.
- Corps contracting needs improvement. Additional discussion/coordination needed. Add project operators and contract personnel.
- Agency processes (i.e. contracting) take time, and adequate leave time is necessary to have contingencies in place (e.g. rental pumps).
- Communication, listening and learning.
- Trust.
- Group focused on management objectives.
- People need to watch for important new data that should be brought to TMT.
- Keep open to new understanding/conclusion as new data is available.

The group then reconvened and highlighted overarching lessons from their list above, that could impact future work of the TMT. And with that, the group expressed appreciation for Dave Wills, as this is his last year as USFWS representative to TMT. And the session was adjourned.

[Facilitator's note: the final question will be asked again at a future TMT meeting, allowing the group time to think about what they saw, heard and thought about at today's meeting]

Present for all or part of the meeting:
Doug Baus (USACE), Trevor Conder (NOAA), Erin Cooper (FPC), Ted Day (BOR), Kyle Dittmer (CRITFC), Scott English (USACE), Barry Espensen (CBB), Joel Fenolio (USACE), Jason Flory (USFWS), Tommy Garrison (FPC), Stephen Hall (USACE), Laura Hamilron (USACE), Peter Hassemer (ID), Greg Hoffman (USACE), Tom Iverson (Yakima Nation), Russell Kiefer (ID), Sean Krandal (Velocity Energy), Stu Levit (Conf. Salish and Kootenai Tribes), Jim Litchfield (MT), Tom Lorz (CRITFC), Agnes Lut (BPA), Mary Mellema (BOR), Charles Morrill (DFW-WA), Tony Norris (BPA), Christine Peterson (BPA), Bill Proctor (USACE), Eric Rothwell (BOR), Ann Setter (USACE), Joe Skalicky (USFWS), Steven Smith (NOAA), Dave Statler (Nez Perce), Pat Vivian (Contractor), Paul Wagner (NOAA), Jason Ward (USACE), Dave Wills (USFWS), Lisa Wright (USACE),

Robin Gumpert, Tory Hines, Jan Kelley, Emily Plummer, and Donna Silverberg, DS Consulting Facilitation Team

Columbia River Regional Forum
TECHNICAL MANAGEMENT TEAM – OFFICIAL MINUTES
2014 Annual Review of Lessons Learned
December 3, 2014

Notes: Pat Vivian

1. Introduction

The 15th annual TMT year-end review of river conditions, hydro system operations and ESA-listed species in the Columbia basin was chaired by Doug Baus, COE, and facilitated by Emily Plummer, DS Consulting. Representatives of the COE, BPA, Washington, Nez Perce Tribe, USFWS, BOR, Montana, CRITFC/Umatilla Tribe, NOAA, Idaho, Yakama Tribe, Salish-Kootenai Tribes, and others participated. This summary is an official record of the proceedings, not a verbatim transcript.

The goal of the TMT annual review is to examine conditions and operational challenges closely over the past year in search of observations that could inform future in-season management decisions. Today's presentations were followed by small-group brainstorming sessions that produced a list of lessons learned in the course of the 2013-14 water year. See section 4d at the end of these notes.

2. Review of 2014 Conditions

What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others? Is there something we can learn from this? Is there anything unique that bears sharing?

2a. Weather Conditions. Kyle Dittmer, CRITFC, gave a presentation summarizing weather conditions in 2014. Last year was very average overall, but there were extremes and dramatic shifts in weather patterns. It was an ENSO-neutral, La Nina year. October to January was extremely dry, then in February a major snow event hit Portland, leading to a wet spring. By the end of April 2014, cumulative inflows had caught up with the norm, essentially delivering six months of precipitation in just three months. The forecast was for above-normal temperatures but actual temperatures were low, and the winter of 2013-14 was colder than usual, especially in December and February. Precipitation was 96% of normal, again with dramatic shifts – some months were extremely dry, others extremely wet. Climate change seems to be making it harder to predict weather patterns and water resources.

The methodology Dittmer uses to predict weather is based on big-picture indicators such as sunspot cycles, multi-variable ENSO predictions, and sea surface temperature forecasts. He analyzes 20 prior water years selected based on how closely they resemble current conditions. Of all the 20 past water years chosen, 2012-2013 is the most similar to the present, with both showing borderline El Nino conditions. NOAA's sea surface temperature report for December suggests that a weak El Nino event occurred in August

to November 2014. The PDO for ocean temperatures is currently negative, which augurs well in terms of producing abundant food supplies for Northwest salmon.

Temperatures in 2015 will be about 1 degree F above normal from November to March, and we'll see 78%-97% of the normal water supply, making this a 97 MAF year, Dittmer predicted. However, precipitation in Portland was only 55% of normal in November. He foresees a greater than normal likelihood of variable weather events occurring, such as windstorms, flooding, dry periods and snowfall.

Overall, the Northwest will probably be drier and warmer than usual – much like it was two years ago. Dittmer predicted four minor snow events in the Portland/Vancouver area, with a 65% probability of snow in December, 80% in January, 60% in February, and 40% in March. A recent NOAA forecast predicts warmer than usual temperatures on the west coast, with below-normal precipitation in Idaho, western Montana and northeastern Washington. The rest of the basin is expected to receive near-normal levels of precipitation, including the southern tier.

Questions and comments:

- **Q:** In terms of recent conditions, is unusual weather becoming the new norm? (Pete Hassemer, IDFG) **A:** Yes. Last year was borderline La Nina, which is supposed to be wet. Instead, we had four months of completely dry weather, which is more typical of El Nino. It's getting harder to look at past weather records to predict the future. The ability to use past models to predict future conditions has been increasingly problematic since 2001 (Kyle Dittmer, CRITFC).

- **Q:** The lower Snake basin is typically hot and dry in summer. Was the summer of 2014 any hotter and drier than usual? (Dave Statler, Nez Perce) **A:** Yes, temperatures were warmer than usual, but the oddest thing was the absence of heat spikes. It looks like 2014 will turn out to be the warmest year on record. Local vineyards had their best year ever, with grapes ripening in late August instead of September. Based on recent years, warm weather is coming earlier, especially on the Snake. Over the past 5-10 years there has been a shift in when water temperatures rise. It would be wise to consider releasing water from Dworshak earlier in the season. (Kyle Dittmer, CRITFC)

2b. Water Management Review. Jason Ward, COE, gave a presentation on flood risk management modeling in 2013-14. From October through January, precipitation was below normal for the entire Columbia basin except the Canadian portion. Then February and March brought a miraculous turnaround. Snowfall at lower elevations throughout the basin shot up to 130% of normal. Spring temperatures were cooler than average throughout a large part of the upper Columbia and the Canadian portion of the basin.

With the sudden increase in water supply, COE flood risk management rules required increased drafting of reservoirs. Precipitation and temperatures throughout the basin in April were nearly normal, so the COE drafted again in May and June. Then precipitation in

June was well below normal. The year ended up nearly normal in terms of water supply, but it was characterized by extremes of dry and wet weather. A drought in northern California also affected southern Oregon, where the water supply was less than 50% of normal.

May 1 is generally considered a good time of year to assess snowpack conditions. As of May 1, 2014, there was healthy snowpack across the basin and up to 180% of normal at several SNOTEL stations. Still, snowpack in the middle Cascades was well below normal. From Mt. Hood going north, snowpack increased.

By July, drought struck eastern Washington and eastern Oregon. At Lower Granite, which is considered representative of the Snake basin, the water supply looked poor. Then the 50% forecast increased from 17 MAF to 20 MAF, which is near normal, although not all of the forecasted precipitation materialized. The year 2014 ended with 19.7 MAF for the Snake, a big improvement over the 2012-13 water supply.

The water supply forecast at The Dalles serves as a flood-risk requirements control point for the entire hydro system. In early February, the water year was predicted to be only 71 MAF on the basis of flows at The Dalles. By end March, the forecast rose by 15-16 MAF, a tremendous increase. The peak unregulated flow in 2013-14, as measured at The Dalles, was 594 kcfs and the peak regulated flow was 358 kcfs. Timing of runoff was about two weeks earlier than the historic peak.

In summary, 2014 had 108% of the normal water supply (94 MAF), an improvement over 2013, which was only 96% of normal. This was largely due to increased flows in the Snake basin, which rose from 70% of normal in 2013 to 98% of normal this year.

Questions and comments:

- **Q:** What is the difference between “normal” and “average” in meteorological terms? Suggests using “average” because it’s not clear anymore what “normal” is (Russ Kiefer, Idaho). **A:** In meteorological terms, “average” has a general meaning while “normal” specifically means the average of a rolling set of 30 years. The timing of this year’s runoff was good for fish, starting out dry and ending with 108% of normal during passage season (Kyle Dittmer, CRITFC).

- **Comment:** Due to the complexity of all that was happening in 2014, it wasn’t always clear how operations for fish and power meshed with overall water management (Dave Statler, Nez Perce Tribe).

2c (i). Adult summary (salmon and lamprey). Charles Morrill, Washington, gave a presentation on adult passage in 2014. The year brought good news for much of the Columbia River basin in terms of adults. A total of 2.7 million adults returned to BON, a level of abundance not seen since 2001. It was a good year for sockeye and fall chinook, and not bad for spring chinook.

In 2012-14, tracking of proportional lamprey passage routes began. An estimated 22% of adult lamprey passing BON in 2014 went through the window as daytime counts, 32% through the window at night, and 42% through the lamprey structure. More lamprey pass BON on the Washington shore than on the Bradford Island side. A small percentage of adults are captured upstream for research.

Highlights of the 2014 adult passage season were:

- Spring and summer chinook had two good years despite poor returns in 2013. Spring chinook adult and jack returns in 2014 were well above the 10 year average, not only at Bonneville but Priest Rapids and Lower Granite. Summer chinook followed the same pattern, with adult and jack returns well above the 10 year averages at Bonneville, Priest Rapids and Lower Granite.

- Sockeye had very good adult returns to Bonneville of 614,000, which eclipsed the 515,000 return of 2012. Sockeye returns were 192,000 at Bonneville, 167,000 at Priest Rapids, and 680 at Lower Granite. These counts are considered good for all three sites. Sockeye dam counts on the lower Snake River may need adjustment to account for fallback.

- Despite concerns about temperature and timing, index counts from Ice Harbor were very close to the 10 year averages at projects all the way through the hydro system. In past years, there have been large disparities, particularly between Little Goose and Lower Granite.

- Summer steelhead returns were below the 10 year average but better than the last two years. Lower Granite Dam saw 160,000 adult steelhead returns, 51,000 of them wild. The wild count is considered high.

- Fall chinook returns of 854,000 to Bonneville didn't meet the 2013 record of 953,000, but the 2014 return was well above the 10 year average. Counts at Priest Rapids dropped by more than half (263,000 to 120,000) but were still above the 10 year average. Fall chinook adults had very good return rates to sites above Granite this year. Usually there's approximately a 16% differential in adult fall chinook returns between Ice Harbor and Lower Granite, but this year the gap was smaller. Returns in 2014 dropped at Lower Monumental and Little Goose, but all were above the 10 year average.

- Coho had one of their best years in a long time – 279,000 total adult returns at Bonneville, with high counts at Priest Rapids and Lower Granite as well.

- Pacific lamprey dam counts in 2014 were 31,000, which is better than the 10 year average of 24,000, according to analyses by WDFW, the COE and USFWS. Lamprey passage daytime counts were not promising, but total lamprey passage tends to be underestimated. Adult returns in 2014 were better than the past two years.

- Shad counts at Bonneville, McNary and Ice Harbor were close to their 10 year averages. Ice Harbor shad counts dropped in 2014 from the previous year, while Priest Rapids Dam passes very few shad.

Questions and comments:

- **Comment:** There appears to be very poor conversion of lamprey adults from Bonneville to The Dalles, based on day counts. The large differential raises concerns about lamprey status in the upper Columbia basin (Dave Statler, Nez Perce Tribe).

- **Q:** Does the fact that lamprey counts from The Dalles to Bonneville increased from 30,000 to 120,000 indicate that visual counts underestimate lamprey passage? Can we expect that much of an increase at each dam? (Tom Iverson, Yakama) **A:** The counts include lamprey seen in all lamprey structures and the lamprey fishway. Day counts don't give an accurate picture of total lamprey passage at upstream projects (Charles Morrill, Washington). While both daytime and nighttime lamprey counts are low, adding the nighttime counts would double the total lamprey count passing Lower Granite Dam (Dave Statler, Nez Perce).

2c (ii). Juvenile summary (salmon and lamprey). Paul Wagner, NOAA, reported on juvenile salmon and lamprey passage timing according to index counts at four key projects (Lower Granite, McNary, Rock Island, and Bonneville dams).

Lower Granite: This year was average in terms of the yearling chinook 50% passage date. Steelhead passage timing was more skewed, with fish showing up so early that 45% had already passed Granite by the time transport collection started. Sockeye passage was right on the 10 year average, but some kokanee might have been counted as sockeye because they look similar. Coho had average passage timing this year. Subyearling chinook passage was typical, with hatchery releases dominating. Flows were high early in the year, so the fish moved quickly. Granite is a poor site to use as an index for Pacific lamprey passage because the sample tank on the Snake River leaks lamprey. This year the 10% passage date for lamprey came early, and the 10% date was also the 40% peak. However, the lamprey collection numbers at Granite are considered unreliable and may underestimate actual passage.

McNary: Yearling chinook passage was typical. The 50% passage date in 2014 and the 10 year average are identical, May 11. In 2014 spill was abundant at McNary, far exceeding the 40% spring spill target. Steelhead 50% passage timing was close to average, while sockeye passage timing was highly atypical, warranting further discussion. There was a double peak in sockeye passage at McNary this year, and the 50% passage date of May 15 was a bit earlier than usual. Coho passage was typical. Subyearling chinook showed up right on schedule, with the 50% passage date on July 4, same as the 10 year average. Few Pacific lamprey ammocoetes were collected this year, and there's no 10 year average against which to measure passage of either ammocoetes

or macropthalmia. McNary is generally considered one of the better sites for lamprey passage.

Rock Island: Both yearling chinook and steelhead showed up right on schedule in terms of their 50% passage dates (May 11 and May 17 respectively). Sockeye passage hit 50% on May 14, which was only a day earlier than their 50% passage date at McNary. Coho appeared right on schedule; the 50% passage date of May 23 was close to the 10 year average. Subyearling chinook passage was average, peaking on July 5. This year's collection of Pacific lamprey ammocoetes was so small that it cannot be considered representative. For macropthalmia, the 50% passage date of August 16 is likewise problematic in terms of drawing meaningful conclusions.

Bonneville: The yearling Chinook 50% passage date of May 9 was close to the 10 year average. Steelhead timing was likewise average, with a 50% date of May 9, which is close to expected timing. Sockeye passage was more unique, with the run passing Bonneville in large groups while passage at McNary was more spread out. One possible explanation is that sockeye took other routes, and these counts represent only those that went through the Bonneville bypass. Coho passage at Bonneville was right on schedule, but there were three peaks instead of two as in prior years. The Spring Creek Hatchery release of subyearling chinook passed Bonneville with a 50% date of June 30 and a 90% date of July 22. The 10% and 50% passage dates for Pacific lamprey ammocoetes were June 20 and June 23. Macropthalmia had a 50% passage date of June 10.

Wagner highlighted other benchmarks of the 2014 passage season:

Mortalities: Apparently lamprey fare more poorly in juvenile bypass systems than any other listed species. Subyearling chinook did relatively well this year, and yearling chinook had mortality rates of less than 1% at all sites, as did coho. Steelhead also had less than 1% mortalities. Sockeye mortality rates were 1.7% at Bonneville. The species with the greatest mortality was lamprey, with rates ranging from 2-6%.

Descaling: McNary had high descaling rates in 2014 compared to the previous 10 years. All species were descaled at McNary, sockeye in particular (14.5%) but coho and yearling chinook were also descaled (6.1% and 5.6% respectively). Rock Island Dam had lower than average descaling rates of chinook and steelhead subyearlings. Coho have been descaled at relatively high rates at McNary before, most notably in 2004-5. Sockeye descaling in 2004 exceeded levels seen this year, but this year's rate of 14.5% was a relapse after years of sockeye descaling rates of around 6-8% at McNary. Descaling throughout 2014 was worse than any seen in recent years. The cause of the descaling remains unclear.

Questions and comments:

- **Q:** Apparently sockeye fared much better in 2014 at Rock Island Dam than at McNary. The findings for fall chinook at Bonneville may have likewise varied from those at other dams. Does retrospective analysis give us a different picture than

we're getting from in-season analysis? If so, could the disparity be a result of sampling programs, and is it worth investigating? (Pete Hassemer, IDFG) **A:** Travel times warrant a closer look. If this year is atypical, it would be good to know the reason, but the information isn't critical because no decisions will be based on it (Paul Wagner, NOAA).

- **Q:** Given that the potential causes of the descaling at McNary were investigated, is the cause still unknown? (Dave Statler, Nez Perce) **A:** Yes, the cause remains unclear, but there's more information to come (Paul Wagner, NOAA).

- **Q:** Are there any speculations as to why juvenile steelhead left the Snake River earlier this year than they left the upper Columbia? **A:** Most index counts are heavily dependent on hatchery releases. For most species, except sockeye and subyearling chinook in the mainstem Columbia, the ratio is 80% hatchery to 20% wild. Passage timing is dominated by hatchery releases (Paul Wagner, NOAA).

3. Reservoir Operations Review

How effective were the proposed actions (SORs) at achieving the desired results? What changes might be necessary to enhance results in the future? How did this year compare to others?

3a. Libby Operations. Joel Fenolio, COE, reported on Libby hydrology during 2014. It was an above average water year. The Libby April to August inflow volume forecast serves as the basis for establishing flood risk, BiOp, and sturgeon operation requirements for the year. The 2014 April-August inflow volume was 6.7 MAF, 113% of average.

Highlights of the 2013-14 water year at Libby were:

The first full relaxation of the December flood control draft occurred in December 2013. Every year Libby drafts to an elevation between 2411' and 2426.7' by end December. Usually the reservoir is required to draft all the way down to 2411', but this year for the first time the elevation target was set at the high end, 2024-26', mainly due to the lack of precipitation in October and November 2013. Because the forecast kept Libby elevation so high, the flood control elevation for the end of April was pushed way down, setting the end of April requirement at 2377'. By end December, the reservoir was at 2426' elevation.

Then precipitation increased in mid-March, causing a 1.3 MAF jump in the forecast from March to April. After releasing minimum flows for most of the winter, the project went to full powerhouse in an effort to get as close as possible to 2377'. On May 1, the forebay elevation was 2386', and Libby had missed its flood control requirement.

Inflows peaked in late May, but there was no late June/early July precipitation as there had been over the past 3-4 years. The project switched from drafting to VARQ refill flows of 16 kcfs when the start of refill was declared. The sturgeon pulse SOR, in effect from May 16-June 18, called for release of 1.17 MAF in addition to 4 kcfs flows. The project

released 17 kcfs until July 1 in an effort to get as close as possible to the end of June 2445' elevation target.

In July, Libby released higher flows in an effort to reach elevation 2452-54' for the Montana SOR, but inflows dropped off quickly, and the project went to bull trout minimums of 9 kcfs through August. The end of August elevation was 2451' and bull trout minimum releases of 9 kcfs continued until elevation 2449' was attained by the end of September.

As an outcome of Libby operations in 2014, peak downstream flows at Bonners Ferry were 45 kcfs, a little above average. The peak elevation at Bonners Ferry was 1761' which is well below flood stage.

Questions and comments:

- **Comment:** Montana benefited from good Libby operations this year, thanks to BPA's efforts in September to accommodate the Kootenai Tribe's sturgeon habitat work (Jim Litchfield, Montana).

- **Q:** What does the Libby draft requirement look like for 2014-15? Will the reservoir have to draft to 2411' or higher at end December? (Paul Wagner, NOAA) **A:** Yes, the December inflow forecast is 6.7 MAF, which calls for drafting to 2411'. Precipitation in Libby basin was 150% of average for October and November 2014, which drives the forecast at this point (Joel Fenolio, COE).

3a (i). Libby sturgeon flow augmentation and habitat restoration: Greg Hoffman, COE Libby Dam, described operations in 2014 to support sturgeon recovery. Sturgeon spawn in the Kootenai River from Kootenai Lake to Kootenai Falls in northern Idaho. Biologists believe they spawn on the receding limb of the hydrograph as the temperature is rising, so the operation to support sturgeon spawning has targeted those conditions over the past 3-4 years by adding flows to the local freshet at Bonners Ferry.

The 2014 operation used cold water until early July, which made it difficult to provide warmer flows for sturgeon. The ultimate goal is to get sturgeon to spawn upstream of Bonners Ferry. Tagging studies indicate that when the hydrograph recedes and the water temperature rises, spawners tend to move into this desirable area. The Kootenai Tribe's habitat project is improving habitat for sturgeon eggs in the substrate above Bonners Ferry and it appears to be a success: IDFG data indicate that spawning upstream of Bonners Ferry has increased over the past two years.

Questions and comments:

- **Q:** What actions are being taken to support sturgeon habitat this year? **A:** The USGS and the COE did a lot of work to determine whether substrate would facilitate spawning. It was determined that sturgeon are spawning in the right place (Greg Hoffman, COE Libby).

- **Q:** How many sturgeon are tagged and what's the size range? (Charles Morrill, Washington) **A:** About 200 total, mostly mature adults of spawning size (Greg Hoffman, COE Libby).

- **Q:** Do the fish have to be tagged every year? (Paul Wagner, NOAA) **A:** No, the longest tags last about 10 years.

- **Q:** Is the theory behind creating pools upstream of Bonners Ferry that sturgeon need refuge from flows that too strong for them to spawn? (Jim Litchfield, Montana) **A:** Findings from the last two years are encouraging, but the effort to get sturgeon to spawn upstream isn't fully successful yet. By 2015-16, the tribe expects the last of the pools to be in place. Since Libby Dam was built, the stretch of river called Braided Reach has gotten wider and shallower. Fish tend to turn around at this point due to lack of habitat for spawning upstream (Jason Flory, USFWS).

- **Q:** Do you see daytime spawning in the lower reach? Approximately how many fish are spawning? (Charles Morrill, Washington) **A:** Yes, every year, a significant amount of eggs have been collected from the lower reach. The current population estimate is around 1,000 spawning-age adults. They spawn an average of every 4 years (Jason Flory, USFWS).

3a (ii). New Libby water supply forecast procedure: Joel Fenolio, COE Seattle, linked a slideshow on this topic to today's agenda after the meeting.

3b. Hungry Horse and the Change in Columbia Falls Flood Stage. Mary Mellema, BOR, gave a presentation on recent changes in the flood stage for the Flathead River at Columbia Falls which is on the mainstem Flathead River and the flood control point for Hungry Horse Dam. Columbia Falls is downstream of the confluence of the North, Middle and South Forks of the Flathead River. Hungry Horse Dam is located on the South Fork and controls flows on that fork only which is about a third of the water passing through Columbia Falls. The north fork and middle fork of the Flathead are unregulated natural flows.

The National Weather Service (NWS) sets flood stages for all rivers in the U.S. Prior to 1997 the NWS flood stage at Columbia Falls was 13 feet. In 1997 the flood stage was raised to 14 feet since no damages were reported at 13 feet. The flood stage remained at 14 feet until the Flathead basin flooded in spring 2012, causing road closures and algricultural losses below 14 feet. As a result the NWS changed the flood stage back to 13 feet. A flood in May 2013 caused minimal damage between 13 and 14.4 feet. It was noteworthy that Flathead Lake elevations downstream were 4' below full elevation. The data from these two floods indicates that backwater from Flathead Lake impacts the flooding of agricultural land below Columbia Falls.

To address these impacts, the current flood stage levels at Columbia Falls are 13 feet when Flathead Lake is within one foot of full elevation (2892-2893 feet), and 14 feet when Flathead lake elevation is below the top foot of elevation or below 2892 feet. Reclamation's latest modeling used these criteria, and Hungry Horse Dam discharges will follow these criteria for flood risk management. The Weather Service will continue to monitor the flood stage levels.

Questions and comments:

- **Q:** Would the BOR reduce flows out of Columbia Falls if Flathead Lake is within the top foot of full and Columbia Falls is at 13'? (Jim Litchfield, Montana) **A:** Yes, if Flathead Lake is within the top foot and there is room to store runoff, discharges from HGH are reduced (Mary Mellema, BOR).

- **Q:** With two unregulated forks, how does the BOR track water sources and make operational adjustments? (David Wills, USFWS) **A:** The BOR monitors flows in all three forks and issues forecasts. There are times when nothing can be done about flooding at Columbia Falls. However, if flows are forecasted to be high and reservoir space is available, the BOR will decrease HGH discharges (Mellema).

- **Q:** What is the likelihood of unregulated flows being so high the BOR is unable to control flooding? (Charles Morrill, Washington) **A:** High. A good snowpack in the south fork usually means heavy snowpack in the other two forks as well. The ability to manage flows depends on reservoir space (Mellema).

- **Q:** Does this impact the SRDs? (Jim Litchfield, Montana) **A:** No, it has no impact on SRDs, which are based on reservoir inflow forecasts (Mellema).

3c. Grand Coulee Drum Gate Maintenance and Incremental Storage Releases.
Mary Mellema, BOR, reported on drum gate maintenance and the incremental storage releases program.

The 11 drum gates across the top of the Coulee spillway between the left and right powerhouses are designed to drop into a chamber so water can flow over the top when spill is required. When the gates are in the up position, Lake Roosevelt can be filled to elevation 1290 feet. Drum gate maintenance is required to keep them in good condition. Ideally maintenance would occur every year when Lake Roosevelt is drawn down for flood risk management. In order to complete the maintenance the elevation of the lake must be below 1255 feet. Maintenance can be deferred if it is a dry water year and Lake Roosevelt does not have to be drawn down below 1255 feet for flood risk management. At a minimum the maintenance must be done once every three years, twice every five years or three times every 7 years. The maintenance requires 8 weeks to complete and Lake Roosevelt must remain below elevation 1255 feet through the whole period. In the spring of 2015 the maintenance will be mandatory, which means the elevation of Lake Roosevelt would be forced down to 1255 feet or below from approximately March 15

through May 15, 2015 if the lake isn't already lowered for flood risk management requirements.

The Lake Roosevelt Incremental Storage Releases Program was developed to provide water from Grand Coulee for additional irrigation use, municipal and industrial uses and also additional instream flow downstream. The program was set up to release an additional 82,500 acre-feet in a normal water year of which 30,000 acre-feet would go to the Odessa area to replace groundwater with surface water, 25,000 acre-feet would be used for municipal and industrial uses and 27,500 acre-feet for instream flow. These releases are dependent on getting the infrastructure in place to use the water and also to get the proper permits to divert the full amount. When there was a drier than normal water year the releases increase to a total of 132,500 acre-feet with more water going to instream flow (44,500 acre-feet) and 33,000 acre-feet replacing interruptible water rights downstream of Grand Coulee Dam. The amount on timing of releases is determined each spring by an advisory panel of fisheries and water managers. This water is provided from Lake Roosevelt, at the full amount of 82,500 acre-feet, Lake Roosevelt would be drafted an additional 1.1 feet and during dry years when 132,500 acre-feet is released, Lake Roosevelt would be drafted an additional 1.8 feet.

In 2014 releases from Lake Roosevelt were 25,500 acre-feet which was about 0.3 feet of elevation. During April, May and June, 13,260 acre-feet was released and in July and August 12,240 acre-feet was released. TMT will be notified each year of the expected volumes released for this program.

Questions and comments:

- **Q:** Where is the water for incremental storage releases coming from? When are flow rates reduced because water was used for incremental storage? Is there any impact on power production? (Russ Kiefer, Idaho) **A:** Any time irrigation flows are provided, BOR also adds more streamflows to the river. It's hard to identify where that water would otherwise have gone (Mary Mellema, BOR).

3d. Dworshak Spring/Summer Operations. Steve Hall, COE Walla Walla, discussed Dworshak operations and how Dworshak inflows affected Lower Granite operations this year. Between January 1 and mid-April, the Dworshak water supply forecast jumped from 84% to 120% of normal and back to 110% of normal. Under flood control rules, outflows should have gone to 25 kcfs, but a special request was made to hold Dworshak at 20 kcfs and sustain that through the rest of April to improve conditions for spring migrants. The reservoir met its BiOp refill elevation target by end June, when inflows roughly matched powerhouse capacity of about 10 kcfs. Dworshak drafted to 1520' by end September.

Temperature augmentation began July 7, a bit early due to warm temperatures in the third week of June, and continued until August 31. By mid-July the project was drafting steadily, and temperatures downstream stayed cool until August 10. The project was limited to 12 kcfs releases in July due to TDG concerns, until a wind event mixed the pool.

When that happens, there is little the COE can do to keep Lower Granite tailwater temperatures below 68 degrees F. On August 12 the thermocline dropped significantly due to wind mixing. Unfortunately this occurred during a near full powerhouse outage because of other prescheduled work. The project had been releasing gas cap flows of 12 kcfs and dropped to 7 kcfs.

On August 15, unit 3 shorted and was forced out of service, which diminished powerhouse capacity by about 50%. The project released what it could while keeping TDG levels in the tailrace below 115%, but it was insufficient to keep temperatures down. The Lower Granite tailwater temperature exceeded the BiOp standard of 68 degrees F for an extended period in late August. By September 12, temperatures were cooling and there were no more exceedances in the Lower Granite tailwater. The unit 3 outage from August 15-September 22 limited discharge capacity, so the BiOp shift of flood control space from Dworshak to Grand Coulee didn't come close to drafting what normal flood control rules required.

Questions and comments:

- **Q:** Dworshak outflows used to be closer to 43 degrees F; now they tend to be above 45 degrees F. Is there a warming trend in the reservoir? (Paul Wagner, NOAA) **A:** The reservoir does not seem to be warming over time. The Dworshak National Fish Hatchery has requested that the project maintain outflow temperatures in the 45 degree range for as long as possible (Steve Hall, COE).

- **Q:** If Granite returns to MOP operations in 2015, will an increase in volume from DWR be enough of a change to be effective? (Charles Morrill, Washington) **A:** This year the COE will purchase additional weather gages to identify when wind mixing occurs, although there might not be enough lead time to change the operation (Hall).

- **Q:** Is there any indication of whether water temperatures out of the Hells Canyon complex are rising? (Statler). **A:** Hells Canyon releases can distort COE modeling results significantly and are impossible to predict. There has been a long-term battle over temperatures between the states and Idaho Power (Hall).

3e. Wanapum Dam Repairs and Impacts to Fish Passage. Peter Graf, Grant County PUD, could not attend today. He will make his presentation at a future TMT meeting.

3f. Upper Snake Flow Augmentation. Ted Day, BOR, gave a slideshow presentation on upper Snake flow augmentation, a program initiated in 1992 to support listed fish in the lower Snake River. The 2008 BiOp called for adaptive management strategies to release the water by August if not earlier. Before 2008, a restrictive rampdown rate of 100 cfs/day tended to push augmentation flows into August of most years. Each basin on the upper Snake operates under its own constraints. Since 2008, the BOR has been working to shift the timing of flow augmentation earlier, or at least before August, basin by basin. These plans change annually to match water resources in each basin.

Day explained the process by which the BOR provides augmentation flows from the Boise and Payette basins and the upper Snake above Milner Dam. Flow augmentation must be water released from April 3-August 31 that would not otherwise be available – it cannot be for flood control. The BOR does extensive accounting for the sake of transparency in distinguishing between flow augmentation and flood control releases. Flood control space must be refilled before releases can be called flow augmentation. There must be clear intent to fill the space at the time, not after the fact. If refill targets are missed due to flood control, the BOR must prove it would have been physically possible to fill the system before saying flow augmentation was provided.

In 2014, augmentation on the Boise basin resembled 2011 when the system didn't quite fill, but that was due to flood control precautions. By the time refill began, flows were insufficient to top off the reservoir. This year, the upper Snake above Milner released 35 KAF of flow augmentation from June 10 to early July. Normally, the Boise basin releases about 40-45 KAF, the upper Snake above Milner 100-200 KAF, and the Payette approximately 150-200 KAF.

In 2015, the BOR will focus on the timing of upper Snake flow augmentation releases. One strategy the BOR employs to accelerate flow augmentation is to reserve reservoir space that would otherwise be filled, rather than topping off the reservoir at its flood control elevation. In 2014, flow augmentation in the Payette basin followed the typical pattern of front-loading releases by leaving reservoir space unfilled.

Questions and comments:

- **Q:** Is it possible to front-load the Payette even more before dropping releases for flood control? (Russ Kiefer, Idaho) **A:** No, because generation is limited to powerhouse capacity by water quality concerns. In 2014, refill started on June 10; there are years when refill can't start until July 1. Nevertheless, the BOR is proactive in finding ways to front-load the system in this way (Ted Day, BOR).

- **Q:** Do the basins differ in how difficult it is to establish proof of flow augmentation? (Paul Wagner, NOAA). **A:** It's easier to prove on the Boise than the upper Snake, where irrigation demand can fluctuate by 5 kcfs (Day).

- **Q:** Can you speak to how recent Idaho laws protect us? (Steve Hall, COE). **A:** Not really, because accounting for flood control releases vs. irrigation storage accounts is an ongoing issue in Idaho (Day).

4. Review of Specific Operations

What was learned about specific operations that were requested by TMT members of other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?

4a. 2014 Juvenile Salmon Survival/Juvenile Transport Adult Returns. Steve Smith, NOAA, gave an overview of PIT tagged salmon smolt survival in 2013-14 and provided analysis of adult returns from transported fish.

Survival rates in 2014: The first iteration of a 2014 report on migration conditions was conveyed in a September 17 draft memo to BPA regarding travel time. A 2011 report, updated annually, compares adult returns from fish that were transported vs. bypassed at Lower Granite. Another comparative report is due in the spring of 2015.

The past year couldn't have been more average in terms of flow and spill, water temperatures, and spring survival rates. Travel times continue to be shorter than they used to be, probably thanks to surface passage structures and increased spill. A little over a third of smolts were transported from Lower Granite in 2014.

Average survival from the Snake River trap in Lower Granite reservoir to the Bonneville tailrace was approximately 50% for yearling Chinook, as it usually is regardless of conditions. From Granite to McNary, steelhead survival was average as well. However, the estimated steelhead survival rate from McNary to Bonneville was so high it suggests model assumption violations that are being investigated. Spill levels at Granite, Goose and Lower Monumental were average. Water temperatures started out cooler than usual but followed an upward trend. All around, 2014 was an average year.

Smolt survival data collection was in its 22nd year in 2014. This year's survival rate of 71.4% for chinook and steelhead smolts from seven hatcheries in the Snake basin is the highest ever seen, 7% higher than the long term average. Yearling chinook survival from John Day to Bonneville was 86% and for steelhead, 99%. Yearling chinook survival from the upper Columbia (also from index hatcheries) was 57% which is about average. This year was one of the best for upper Columbia steelhead survival at 46.8%.

Snake River weekly data on median travel times of yearling chinook from Granite to Bonneville indicate the recent trend of shorter travel times and faster migration continued in 2014, especially early in the season. This was especially true for yearling chinook from the beginning to the end of migration season regardless of flows. Travel times seem to be decreasing in low flow years as well as high flow years. Steelhead data also indicate that travel times have gotten shorter under a variety of flows.

Yearling chinook survival in 2014 was average at 94% in the Snake and approximately 90% in the lower Columbia. These numbers are based on PIT tag detection of hatchery and wild fish combined. The 2014 steelhead reach survival estimate was 101.8% indicating data problems in two consecutive reaches.

For a few selected longer reaches, Smith compared 2014 data with the 20 year average. Yearling chinook survival from Granite to McNary has held steady for 20 years at 76%, and 2014 steelhead survival was 74%. From McNary to Bonneville, yearling chinook had 71.5% estimated survival and steelhead had 100% estimated survival.

Overall hydro system juvenile survival estimates in 2014 from the Snake River trap to Bonneville are 50% for yearling chinook and 77% for steelhead (the steelhead estimate is considered unreliable). A little over a third of yearling chinook were transported to below BON, which is average for the past few years. Because start dates are no longer staggered, migration started at about the same time at all dams. Lower Granite had a lower percentage of fish going through the collector, but when those fish went back to the river, they were more likely to be transported from a downstream dam than they were in past years.

Adult returns of transported fish: Returns of transported vs. bypassed smolts were analyzed on a seasonal basis from 2009-2012 in terms of approximately when they passed the dams as juveniles. A "time stamp" is needed to estimate seasonal SAR patterns. From 2006-12, the benefit of transport declined from earlier levels, probably thanks to improved conditions for in-river migrants. Nonetheless, the return rate for transported fish that were tagged upstream of Granite is still higher than for bypassed fish throughout most of the season. Fish that pass the dam without encountering the collection system have a higher return rate. In the past few years, the benefit of transport has been so small that any conclusions depend on the standard being applied.

Wild chinook tagged upstream of Granite in 2009 and transported returned at an 80% higher rate than bypassed fish. By 2011, transported chinook did better in terms of travel time, but bypassed fish had higher survival rates. In 2012, chinook that were the earliest transported had about the same return rate as those that were bypassed. Transported fish had higher return rates than bypassed fish through all periods that were measured.

Smith offered to attend a regular TMT meeting and give a presentation on the fall Chinook transportation study of 2006-12 if people are interested.

Questions and comments:

- **Q:** What are some assumptions that could lead to model violations in the steelhead data? (Jim Litchfield, Montana) **A:** When fish bypass John Day Dam undetected, the assumptions of the model aren't replicated at other dams downstream, so the estimates will be biased (Smith).

- **Q:** Will your update on fall chinook for AFEP cover late season transport? (Paul Wagner, NOAA). **A:** No, the AFEP presentation will just cover June releases.

- **Q:** In 2014 TMT spent a lot of time on juvenile transportation. Will data from this year inform the approach, or will TMT struggle with the same concepts next year? How does transport relate to straying? (Doug Baus, COE) **A:** All of these data show fish tagged upstream of Granite. From Granite on down, the two models are not yet integrated (Smith).

4b. McNary Dam Operations and Juvenile Descaling Review

4b (i). Review of descaling issue: Ann Setter reported. This year, sockeye descaling rates at McNary were higher than usual – 581 this year compared to 186 in 2013. The descaling rate for sockeye smolts was high in 2014, although bypass collection was twice what it was in 2013 and higher than in 2012. In 2013, NOAA collected 120,000 sockeye smolts compared to approximately 280,000 smolts in 2014. The largest numbers of sockeye pass in May. In 2014, descaling rates for sockeye increased as the season progressed.

Flow often influences the amount of debris, which is always related to descaling. But 2014 with its high prevalence of descaling was only average in terms of flows. Trash raking frequency is also a factor, as it removes debris from the fish units. In 2013, crews collected more trash than in 2014. Debris collection was concentrated in March 2014, while in 2013 it was more constant throughout the season. This year because of high descaling, the staff frequently tested the trash rack for debris accumulation and found nothing. However, a floating mat of debris grew so large in the McNary forebay that trash raking was ineffective and spill was infeasible.

Based on successful past experience, the COE is in the process of acquiring a "log bronc", a type of boat that can be used to gather debris for removal. A log bronc is especially needed when units are out of service because that's where debris collects.

There is interest in finding an economical way to restore the McNary head gates to their original condition, which allowed closure within 10 minutes in an emergency. The 10-minute closure capability was compromised when the fish units were installed.

In response to concerns that the 2014 fish guidance efficiency study at McNary might have been a factor in descaling, Setter showed TMT the results when the units went from the upper end of 1% efficiency to the midpoint of 1%. No noticeable correlation was found between unit operations at McNary and high sockeye descaling rates.

<u>Questions and comments:</u>

- **Q:** If similar levels of descaling happen in 2015, what can we do differently? (Dave Statler, Nez Perce Tribe) **A:** The COE is acquiring a log bronc so if a debris mat forms in the McNary forebay, it can be removed. Note that removal of debris in 2014 did not reduce the sockeye descaling rate (Setter).

- **Q:** Could this problem be bigger than one project? **A:** BPA is looking into that possibility, and Washington plans to follow up with invasive species experts on the debris problem (Tony Norris, BPA).

4b (ii). Review of operational factors in descaling: Trevor Conder, NOAA, gave a broad perspective on operational factors that could have influenced high sockeye descaling rates at McNary in 2014 and possible ways to reduce descaling in future.

Sockeye descaling started out low in 2014 but jumped for an extended period to 15%, which is considered an unacceptably high rate. In previous years descaling was less than 10% but it seems to be increasing, with several episodes of greater than 10% descaling in 2013. There is also a tendency for descaling to increase throughout the sockeye run. The cause is unclear. Fish could be spending more time in gatewells, or it could be changes in flows, debris levels or water temperatures. Descaling could be related to repair of Wanapum Dam and lower tailwater elevations at Rock Island Dam upstream. Debris is a likely cause; McNary has a known history of debris problems.

Preliminary reach survival data indicate that sockeye survival from Rock Island to McNary was the lowest to date in 2014, and survival rates from Rock Island to Bonneville and for upper Snake sockeye were also lower than usual. By contrast, sockeye survival estimates were high from Lower Granite to Bonneville and in the lower Snake River.

Overall, sockeye descaling was higher in 2014 than ever, and there is preliminary evidence of low sockeye survival due to descaling upstream of McNary. This year project staff filled over 100 dump trucks, removing 1,264 cubic yards of debris from the McNary forebay, an area roughly the size of the Lloyd Center parking lot.

Conder suggested one possible way to reduce descaling is more frequent cleaning of trash racks throughout passage season. It is hoped that the changes now underway – acquisition of a log bronc, completion of Wanapum Dam repairs, and FPOM scrutiny of debris issues at McNary – will bring down sockeye descaling rates in 2015.

Questions and comments:

- **Q:** Is there a biological reason that certain species are more susceptible to descaling? Why does sockeye descaling increase during passage season? **A:** Sockeye are very fragile; descaling is directly proportional to the thickness of the body wall. Hatchery sockeye have a thicker body wall than wild sockeye, and sockeye in general have a thinner body wall than chinook. As passage season progresses, fish tend to be smaller and more susceptible (Ann Setter, COE).

- **Q:** Has NOAA considered passage timing differences between the Snake and the mid-Columbia projects as a possible explanation for the descaling increases? Is it possible that injured fish seen at McNary in 2014 were not freshly descaled? (Tom Lorz, CRITFC) **A:** Mid Columbia fish are naturally reared and tend to be very broad fish, which could be a factor in their higher survival rates. If mid Columbia fish migrate earlier, they might also have a better chance of survival, but this year their timing was average. Estimating when fish were descaled is a subjective process (Trevor Conder, NOAA).

4c. Lower Granite Adult Trap Operation. Ann Setter, COE, gave a presentation on temperature management at the Lower Granite adult ladder and trap. The temperature problems of July and August 2013 that stalled adults were not repeated this year. The

COE rented pumps again to cool the ladder, and passage was uninterrupted throughout the season.

However, there were 74 days when water temperatures were too warm to support trap operations. The trap usually operates from March to November, with August being the most unreliable month in terms of flows and temperatures. The past two years are the first in which the trap failed for an extended time since 2006-07, when it was out of service for 41 days.

On July 7, 2014, the pumps were being used to cool the ladder and the cable failed, so the trap had to shut down. By August 6, emergency rental pumps were providing cool water to the ladder, and the trap was back in service again for several hours each day. By August 21, a 24-hour rental pump operation went into effect and there still wasn't enough cool water to use the trap.

By August 30, the trap had enough water to operate for 4 hours a day, and on September 1 the pumps ran continuously for sampling. On September 11 they were turned off due to to cooler nights. The trap operated normally until 5 am, September 24, when the powerhouse went out of service and there was no power to run the pumps. As a result, there was very little adult passage that day.

The COE plans to rent pumps again in 2015 and evaluate their effectiveness. FFDRWG is wrestling with this issue and has suggested using a backup generator to supply power to the pumps. FPOM also might have engineering suggestions.

Questions and comments:

- **Comment**: Hopes the COE is prepared to provide rental pumps on an emergency basis if they are needed (Dave Statler, Nez Perce Tribe).

- **Comment**: Appreciates the COE's efforts to acquire rental pumps in a timely manner for the next migration period (Pete Hassemer, IDFG).

4d. 2014 Lessons Learned. Participants broke into small group discussions and designated a spokesperson to articulate the group's reflections regarding conditions and operations in 2013-14:

1. Lessons learned from 2012-14 Libby operations may streamline 2015 operations, specifically on the descending limb of the hydrograph. We've learned a lot about temperature cues in sturgeon spawning.

2. Mid-Columbia operations may inform 2015 McNary operations in terms of sockeye descaling. Hopefully by next year, we will know more about the impacts mid-Columbia dam operations had on sockeye at McNary.

3. Agency processes, such as contracting, take time. Adequate lead time is needed to have contingencies in place, e.g. rental pumps for the Lower Granite trap. The COE contracting process could be improved, and more discussion of problems is needed early on. It might help to involve project operators in the contracting process, or to involve contracting personnel in the design process.

4. It will be important every year to keep track of how the variable flood stage at Columbia Falls is going to impact Hungry Horse Dam operations.

5. An increasing tendency toward highly variable weather patterns calls for more nimble responses in real time operations.

6. Should upper Snake flow augmentation be used to fill in natural troughs or augment peaks in the water supply?

7. TMT needs to stay focused on the management objectives and issues at hand. Keep things simple, and remember that not all relevant data may be available. Field trips help to build teamwork and understanding.

Name	***Affiliation***
Agnes Lut	BPA
Ann Setter	COE Walla Walla
Barry Espenson	CBB
Bill Proctor	COE
Charles Morrill	Washington
Christine Peterson	BPA
Dave Statler	Nez Perce
David Wills	USFWS
Doug Baus	COE
Eric Rothwell	BOR
Erin Cooper	FPC
Greg Hoffman	COE
Jason Flory	USFWS
Jason Ward	COE
Jim Litchfield	Montana
Joe Skalicky	USFWS
Joel Fenolio	COE Seattle
Kyle Dittmer	CRITFC
Laura Hamilton	COE
Lisa Wright	COE
Mary Mellema	BOR
Paul Wagner	NOAA
Pete Hassemer	Idaho
Russ Kiefer	IDFG
Scott English	COE

Sean Krandal	Velocity Energy
Steve Hall	COE
Steve Smith	NOAA
Stu Levitt	Salish Kootenai
Ted Day	BOR
Tom Iverson	Yakama
Tom Lorz	CRITFC/Umatilla
Tommy Garrison	FPC
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